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**SIEMENS**

PATENT  
Attorney Docket No. 2003P15291US01

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

Inventor:	V. Philip et al.	)		
		)	Group Art Unit:	1762
Serial No.:	10/733,740	)		
		)	Examiner:	K. Bareford
Filed:	December 11, 2003	)		

Title: REPAIR OF ZIRCONIA-BASED THERMAL BARRIER COATINGS

Commissioner For Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**DECLARATION OF ANAND KULKARNI**  
**UNDER 37 CFR 1.132**

1. I, Anand Kulkarni, a citizen of the India, hereby declare and state as follows:
2. I have been continuously employed by the Assignee of the above referenced application, Siemens Power Generation, Inc and its predecessor Siemens Westinghouse Power Corporation from October, 2004 to the present. I am currently a Senior Engineer in the Materials and Technology Department, and work in the field of materials and coatings.
3. I received a Ph. D degree in Materials Science and Engineering in 2002 from SUNY Stony Brook, and a Masters degree in Materials Science and Engineering in 1997 from Indian Institute of Technology, Mumbai, India. My combined academic and commercial experience in Materials Science & Engineering totals approximately 12 years.
4. I understand that the USPTO Examiner has rejected certain claims in the above-cited application on the basis that the original specification did not reasonably convey to one skilled in the art that the inventors had possession of the term 'unbound' to modify the phrase

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'homogenous mixture'. I also understand that the Board of Appeals has upheld the Examiner's rejection because "Applicants have not factually supported their contention that one of ordinary skill in the art would readily understand that the constituents are unbound."

5. I understand and agree that the term 'unbound' means that the constituents are not held in physical or chemical combination. I respectfully submit that the specification clearly and reasonably conveys to one skilled in the art such as myself that the inventors had possession of the term 'unbound' to modify the phrase 'homogenous mixture' and that one of ordinary skill in the art such as myself would readily understand that the constituents are clearly mostly (but not necessarily completely 100%) unbound after mixing, and thus mostly freely flowing relative to each other within the homogenous mixture.

6. I understand that the invention relates to an improved temperature resistant coating that combines zirconia with a material having a coefficient of thermal expansion and/or thermal conductivity that is closer to that of zirconia than the corresponding property of alumina. See e.g. specification page 2 lines 21-24. The coating is formed from a composite powder having a first constituent that is a relatively high melting point ceramic material that normally cannot be applied by a low velocity oxygen fuel (LVOF) process, for example, either stabilized or unstabilized zirconia, and a second constituent that is a relatively low melting point ceramic material that can be at least partially melted or fully melted and successfully applied by a LVOF process, for example, calcium titanate or strontium titanate. See e.g. specification page 4 lines 2-7.

7. The two constituents are then mixed together to form a homogenous mixture prior to LVOF spraying, such as by ball milling or wet chemical mixing. See e.g. specification page 4 lines 7-9. As shown in Figures 1 and 2, the first constituent powder is stored in a first container and the second constituent powder is stored in a second container, the first and second constituent powders are then mixed as previously explained. The patent mostly focuses on ceramic powders and not metallic powders. Ceramic powders (in their oxide form) are covalently bonded and hence cannot chemically bond with each other when mixed together. Also, ball milling doesn't create enough forces to physically bond together either. These mixed powders are then discharged into a heat source at a temperature sufficient to at least partially melt the lower melting temperature second constituent particles such that it forms splats that can surround and encase the unmelted or potentially partially melted particles of the high melting temperature

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first constituent particles. See e.g. page 5 lines 8-12. One such example is a cermet coating (tungsten carbide-cobalt) coating where the ceramic tungsten carbide powder is encased in a low melting soft cobalt matrix. A similar analogy can be applied to the two ceramic constituents in this application.

8. Upon reading the specification and in particular the portions of the specification discussed above, those skilled in the art such as myself would readily understand that mixing the first and second constituents do not physically or chemically bind the constituents together, as mentioned above. In fact, those skilled in the art such as myself would readily recognize that the mixing process should not bind the constituents together because, after mixing, the constituents are LVOF sprayed. Thus the mixed constituents are typically fed through a powder host from the powder feeder to the spray nozzle. The mixed constituents are carried using a carrier gas that provided a fluidized bed effect and hence the particles should be unbound and freely flowing relative to each other so that they can enter the LVOF sprayer and the heat generated by the LVOF process can melt the second constituents such that they surround and encase the first constituents.

9. Moreover, the specification clearly conveys this point to those skilled in the art such as myself because ball milling is understood by those skilled in the art to be a process that uses a ball mill filled with the material(s) to be mixed plus a mixing media (such as ceramic balls, flint pebbles or stainless steel balls). Ball mills are also commonly used to grind or reduce the size of materials. See e.g. Wikipedia definition of 'ball mill'. Chemical mixing is typically defined as a process wherein two or more species in a certain chemical state (or composition) are mixed so as to produce a homogenous species of a modified chemistry that has a distinct set of properties. It is my opinion that mixing the first and second constituents via ball milling or wet chemical mixing would not cause the first and second constituents to become physically or chemically bound, but rather would simply cause the first and second constituents to be a freely flowing mixture, as explained above. Even if the ball milling resulted in some physical bonding or encapsulation of the high-melt constituent with the low-melt constituent due to the difference in modulus, from a flame spray standpoint, the low-melt constituent will still enable the bonding in between the high-melt constituents.

10. I note that wet chemical mixing (and possibly ball milling to a lesser extent) technically could cause a small and deminimus amount of first and second constituents to be

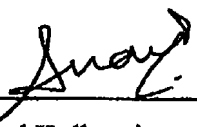
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somewhat weakly bound by the moisture in the wet mix (or grind pressure), however, those skilled in the art would readily recognize that most of this deminimus bonding would be subsequently unbound by normal evaporation, vibration or the beginnings of the LVOF process and thus have no practical effect on the inventive aspects discussed above. I also submit that those skilled in the art such as myself would readily understand that the invention clearly does not require the mixed first and second constituents to be completely (i.e. 100%) unbound and, moreover, more precisely readily understand that the constituents clearly should be mostly unbound (i.e. more unbound than bound). An analogy that may prove useful is if salt and pepper particles were so mixed by ball milling or wet chemical mixing within a shaker, technically some of the salt and pepper particles would be bound, however, for all intents and purposes, the shaker would effectively allow the mostly freely flowing salt and pepper particles to effectively separately exit the shaker without being completely unbound to each other.

11. Accordingly, it is my opinion that those skilled in the art such as myself would readily recognize that the specification clearly convey that the mixed constituents should be mostly freely flowing and unbound relative to each other to effectuate the LVOF process. It is also my opinion that those skilled in the art such as myself would readily recognize that a small and deminimus amount of binding may occur between the first and second constituents.

12. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or of any patent issuing there from.

Dated: 07/09/2007

By:   
Anand Kulkarni